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Dated 16 December 2003

Patents Form 1/77

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21NOV02 E765304-2 C91729
P01/7700 0.00-0227193.0

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference — BB- PITCH

2. Patent application number *(The Patent Office will fill in this part)* — 0227193.0

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

ADRIAN MICHAEL GRIFFITHS
WATER SIDE,
PRESTON BAGOT,
HENLEY-IN-ARDEN,
SOLIHULL.
B95 5ED

Patents ADP number *(if you know it)* 7016688 001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention — PITCH ATTITUDE ADJUSTMENT FOR AN INTERCONNECTED BICYCLE

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

WATER SIDE,
PRESTON BAGOT,
HENLEY-IN-ARDEN,
SOLIHULL,
B95 5ED

Patents ADP number *(if you know it)*

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

NO

Patents Form 1/77

9. Enter number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	0
Description	3 ✓
Claim(s)	0
Abstract	0
Drawing(s)	0

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature Adrian Griffiths Date 17.11.2002

12. Name and daytime telephone number of person to contact in the United Kingdom

ADRIAN GRIFFITHS
0121 482 3632

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

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PITCH ATTITUDE ADJUSTMENT FOR AN INTERCONNECTED BICYCLE

Terminology

Coupling ; When one parameter influences another, the parameters are said to be coupled.
Interconnection ; A means of connecting the front and rear suspensions in such a way that vertical motion of one influences vertical motion of the other.

Background

Conventionally, front and rear suspensions for bicycles are sprung independently, that is to say that the front springing arrangement is not coupled to the rear springing arrangement. A few bicycle designs (and even fewer that have reached series production) have interconnected front and rear suspensions.

The concept of interconnection has been borrowed from the automotive industry. Cars such as the Citroen 2CV (mechanically interconnected) and the Citroen BX (interconnected hydraulically) used the principle of interconnection to reduce the pitch stiffness of the suspension to cushion the vehicle occupants from unpleasant pitching motion.

Recently features such as roll control and automatic levelling (whereby the vehicle attitude is corrected for the influence of the addition of payload, mostly at the rear axle) have been introduced on such interconnected suspensions.

Pitch attitude control may be achieved with conventional uncoupled suspensions, but is considerably simpler if the front and rear suspensions are interconnected.

This invention relates to bicycles with interconnected suspensions.

The benefits of pitch attitude control.

On a bicycle, the advantages of having adjustable attitude are as follows ;

- When riding up or down hill, the rider can adjust his/her centre of gravity position longitudinally without necessarily having to take weight off the saddle. In the downhill case it is extremely important for the rider to move his/her centre of gravity rearwards to prevent the possibility of completely unloading the rear wheel under even quite modest braking. On a conventional bicycle the degree to which this can be achieved is limited by the ability of the rider to hold onto the handlebars to maintain control (i.e. the length of the rider's arms).
- The pitch attitude control feature can be used to compensate for payload (e.g. panniers or child seats) that would otherwise upset the attitude of the bicycle.
- Under level conditions, the rider may wish to adopt either a streamlined 'head down' position when he/she is travelling at speed, or a 'sit up and beg' position which may be more suitable for low speed use. In the latter position, the rider is more relaxed due to his/her back and neck being straighter though the bicycle is less stable, more agile and aerodynamic drag is increased. This change in position can be achieved with the pitch attitude control feature. The dropped handle bar feature seen typically on conventional sports or racing bicycles to some extent provides the rider with this choice of riding positions. The rider may either may either brace his/her weight against the dropped part of the handlebars or against the higher transverse part of the handle bars. This solution suffers form certain disadvantages, namely ;
    - The rider's centre of gravity does not move very much resulting from a change from one position to the other. The consequent benefit of increased stability that comes with moving the centre of gravity forward will not be as great as it would be with a bicycle with pitch attitude control.
    - The range of riding positions is limited by the extent to which the rider can tolerate riding with a heavily arched back. If the bicycle has attitude control, this constraint is eliminated.
    - The brakes and gear selection controls can be designed for optimal use when the rider adopts either one of the two positions. With the pitch attitude control feature, the

relationship between the rider's hands and the controls does not change and therefore remain optimal.

Brief Description of the Invention

The invention comprises

- A bicycle with interconnected front and rear suspensions. The interconnection feature will have effect of reducing the pitching stiffness of the suspension i.e. if the rear wheel is constrained to move upwards the front will tend to move downwards. This will typically be achieved by mechanical or hydraulic means but may be achieved by other means such as pneumatic or via electro-mechanical devices.
- A means within the interconnection arrangement to preload the suspension towards a 'nose up' or 'nose down' attitude. This is likely to be a simple mechanical lever acting on the mechanical, hydraulic (etc.) interconnection system that is manually controlled by the rider, however it is envisaged that an automatic adjustment means could also be used.
- The pitch adjustment means will have a suitable locking means to ensure that no further movement of the lever or adjustment means takes place once the adjustment has been make.

Detailed description of the invention

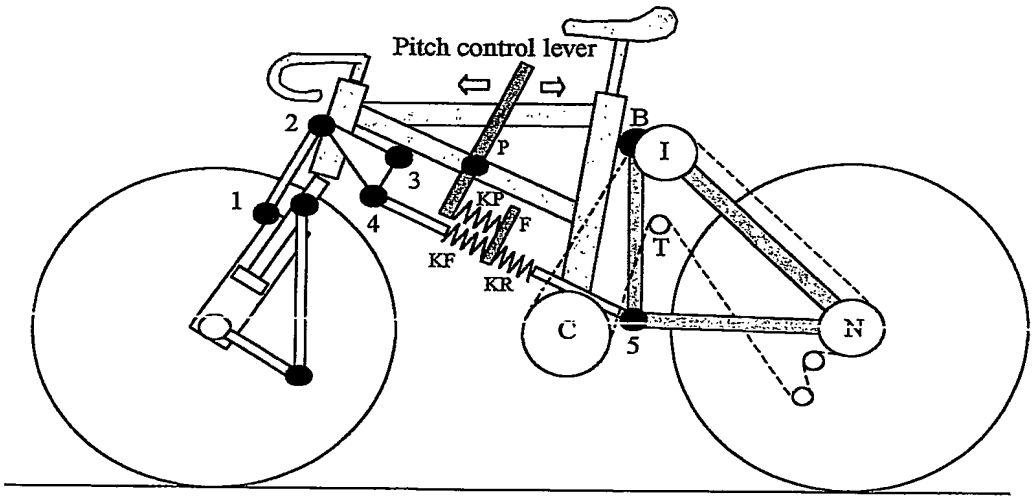

Diagram 1

Front suspension = as per diagram 4(c)
Rear suspension = as per diagram 5
Joint 1 = connection between fork body (which moves with the wheel) and link
Joint 2 = connection between link and bell crank
Joint 3 = connection between bell crank and frame
Joint 4 = connection between bell crank and interconnection
Joint 5 = connection between interconnection and rear triangle
P = Pivot connecting the pitch control lever to the frame.
F = Spring abutment part (constrained to slide along the frame along a line roughly parallel to a line joining 4 and 5)
KF = front bounce (in phase) spring
KR = rear bounce (in phase) spring
KP = pitch spring
B = Bearing connecting the frame to the rear triangle
I = Idler gear mounted via a bearing to the rear triangle
C = Crank pulley mounted on the frame

T = Chain tensioner mounted on the frame or rear triangle
N = Nest of gears on rear wheel

Diagram 1 above shows a mechanically interconnected bicycle. The spring KP controls the pitch stiffness of the bicycle and the load in the spring KP controls the pitch attitude of the bicycle. The pitch control lever pivots about point P. The load in spring KP is therefore determined by the position of the lever and the attitude of the bicycle. By moving the lever forwards (away from the saddle) or backwards (towards the saddle) the bicycle will be made to adopt a 'nose up' or 'nose down' attitude respectively. Diagrams 2 and 3 show the effect on the attitude of the bicycle relative to the ground of adjustment of the pitch control lever forwards and backwards respectively.

The lever will have a locking device to ensure that, once adjusted, no further movement takes place until the next time the pitch attitude is adjusted. This could be similar to the button on a typical car handbrake for example.

By placing the pivot P below the point at which the spring KP is attached, the logic of the lever may be reversed (i.e. forward movement of the lever causes 'nose down' attitude etc.).

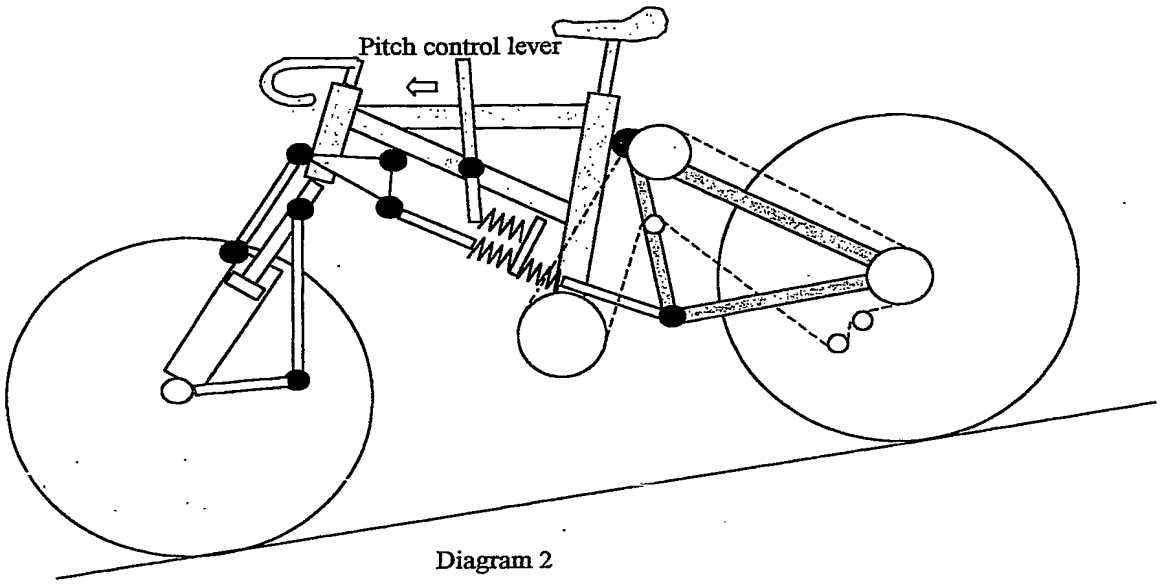

Diagram 2

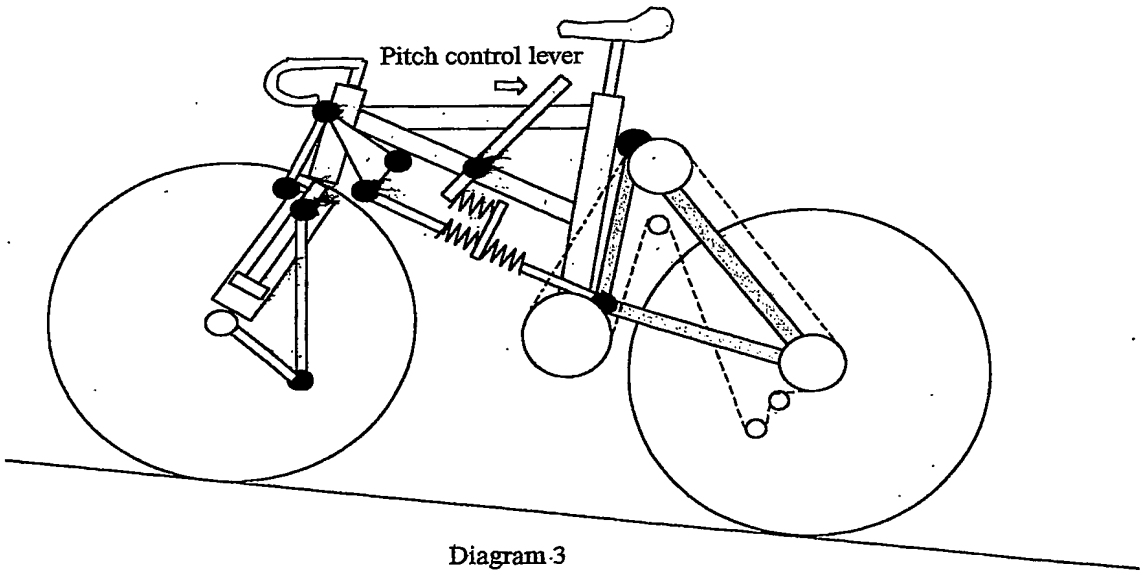

Diagram 3

PCT Application
GB0305078